

A.34 WATER RESOURCES FEASIBILITY TO DECISIONS APPLIED SCIENCE

Amended on June 3, 2011. This amendment presents the final text for this Appendix, which replaces the prior text in its entirety. The changes include: The priority topics in Section 2.1 have been substantially revised and expanded. This program element will be implemented in two Stages. Twelve month Feasibility-Stage 1 projects will be awarded with an Option for three year Decisions-Stage 2 projects to be awarded at the end of Stage 1. Note that the due dates have been deferred: Notices of Intent to propose are now due July 1, 2011 and proposals are due September 30, 2011.

1. Scope of Program

1.1 Overview

The NASA Earth Science Division, Applied Sciences Program solicits proposals that develop and demonstrate innovative and practical applications of Earth science observations, models, and research to support water resource decisions with an emphasis on drought prediction, assessment, adaptation, and mitigation.

This solicitation is specifically focused on the ability of organizations (public and private) to leverage NASA capabilities in order to advance their skill to monitor, identify, assess, predict, and respond to water resource deficits. Furthermore, this solicitation will seek the development of sustainable solutions that incorporate solid business/organization models that strive to incorporate performance metrics, fiscal realism of sustained operations, and the vision to meet the drought challenges of both today and in the future.

This solicitation will initially support one-year Feasibility studies of potential applications. NASA will then down-select and continue support of a subset of innovative, impactful applications in subsequent three-year Decisions¹ efforts. The Decisions efforts develop the application with and transition to entities responsible for sustained operational support.

1.2 Applied Sciences Program Objectives

The Applied Sciences Program supports efforts to discover and demonstrate innovative and practical uses of Earth science data, knowledge, and technology. The Program funds applied science research and applications projects to enable near-term uses of Earth science, transition applied knowledge to public and private organizations, and integrate Earth science and satellite observations in organizations' decision-making and services. The projects are carried out in partnership with end-user organizations. The Program thus serves as a bridge between the data and knowledge generated by NASA Earth science and the information needs and decision-making of Government agencies, companies, regional associations, international organizations, not-for-profit organizations, and others. The Program allows and encourages private sector companies to submit

¹ "Decisions" is a term that the Applied Sciences Program has used in the past for standard applications development projects for decision-makers. The reader should NOT assume past descriptions of "Decisions" solicitations are valid for this solicitation. Please read the solicitation thoroughly.

proposals and/or be involved in project teams. For more information visit the Applied Sciences Program website at <http://appliedsciences.nasa.gov/>.

The Applied Sciences Program seeks projects that pursue innovative uses and integration of an array of Earth science results and develop and demonstrate improvements to decision-making. NASA Earth science results can include Earth science measurements (particularly NASA spacecraft observations, both in orbit and planned), outputs and predictive capabilities from Earth science models (especially ones that use NASA spacecraft observations or are NASA-sponsored), algorithms, visualizations, new knowledge about the Earth system, and other techniques and geosciences products. Proposals may blend commercial remote sensing and geospatial information with NASA Earth science measurements to integrate into and improve decision-making.

The Applied Sciences Program is currently focused on four of the nine U.S. Group on Earth Observations (USGEO) Societal Benefit Areas (SBA): Water Resources, Health and Air Quality, Ecological Forecasting, and Disasters.

The Applied Sciences Program Water Resources application area promotes the routine integration of Earth science into water resource management for sustainable use. The Water Resources application area primarily focuses on themes of drought, stream flow, flood forecasting, water supply and irrigation, water quality, and climate impacts on water resources.

The Applied Sciences Program seeks innovative projects focused on the integration of Earth science research results into decision-making activities. Thus, this solicitation will not accept proposals to conduct substantially new research in Earth science; for this, the reader is referred to the Earth Science research and analysis appendices (Appendices A.1 through A.32).

2. Scope of Solicitation

The objective of this solicitation is to select applied research and applications projects in the area of water resources with a focus on drought-related topics and drought management solutions. Successful projects will advance organizations' use and application of Earth science observations and models in decision-making associated with water resource management against drought. The projects should include all relevant NASA satellite mission observations and can include data products from non-NASA satellites, including foreign satellites and commercial products if used in conjunction with some NASA capabilities.

This solicitation expects strong partnerships between the science/technology organizations and the management/policy decision-making organizations. Solicitations that target international development applications are encouraged to team with U.S. business/management and policy organizations (e.g., DoS, USAID, DoD, USDA, or other U.S. agency with a foreign service mandate and appropriation) and/or international financial institutions, such as The World Bank. International development proposers are also referred to the SERVIR Applied Sciences Team (Appendix A.36).

This solicitation is open to applied science projects at all Application Readiness Levels (ARL)², from exploitation of mature applied science products to new, game-changing applied science products. However, this solicitation is seeking only projects that can realize successful application development and transition to sustainable operations (ARL 8-9) within the timeframe of the solicitation (1-4 years).

Proposed projects may be performed with partners at any level, subregional (e.g. local, state) to international. However, sub-U.S. State level (or international equivalent) proposals must include multiple sites or demonstrate broad, regional impacts to illustrate and ensure that project results can accrue broadly.

2.1 Priority Topics

This solicitation seeks proposals that use NASA Earth science products and information to affect water resource management and policy decisions aligned with one or more of the following topics:

- Drought prediction, assessment, adaptation, and mitigation in support of food security/efficiency;
- Drought prediction, assessment, adaptation, and mitigation in support of energy security/efficiency;
- Drought prediction, assessment, adaptation, and mitigation in support of natural resource conservation;
- Drought prediction, assessment, adaptation, and mitigation in support of household, municipal, industrial, and in-stream demands for water (both quantity and quality); and
- Access and availability of actionable drought information.

This solicitation is strategically interested in proposals that utilize, among other capabilities, observations from the thermal bands of the electromagnetic spectrum for water resource decision making.

The Program expects to support projects across a range of risks and a range of expected returns and rewards.

2.2 Project Scope Detail and Award Information

This solicitation is seeking Feasibility-to-Decisions projects. The objective of Feasibility-to-Decisions solicitations is to identify, prioritize, and implement high-reward applications ideas with committed partners. Feasibility-to-Decisions projects are one-year awards (Feasibility-Stage 1). Based on an evaluation at the end of year one, the Grantee MAY be selected to continue work in years two through four (Decisions-Stage 2). An assessment of Feasibility-Stage 1 progress

² *Application Readiness Level (ARL)* is an Adapted Technology Readiness Level (TRL) for use in applications of Earth science to decision-making activities. The ARL assesses the maturity of Earth science applications projects and allows NASA to track integration of Earth science into decision-making by articulating expected advancement along a continuum from science to sustainable operations.

reports, annual report, partner commitment, and in-person presentations will be used to approve Decisions-Stage 2 award continuations.

2.2.1 *Scope: Feasibility-Stage 1*

This stage of the solicitation seeks proposals that generate and test preliminary ideas across a range of risk/reward for application of drought products, processes, and partnerships to determine their potential value and the potential for a more in-depth implementation in Decisions-Stage 2 award continuations (see section below). At the end of Stage 1 the project should, at a minimum:

- Describe, comprehensively, the drought-related challenge, its importance, and the existing methodologies used to respond to that challenge;
- Examine the existing decision-making process, tools, science-basis, information, and resources (e.g. personnel) that affect the identified drought-related challenge;
- Determine the feasibility and assess/substantiate the potential impact of integrating Earth science capabilities on the identified drought-related challenge;
- Define a plan for quantifying the potential impacts of the proposed activity on the identified drought-related challenge;
 - Impacts are defined as quantifiable effects as specified by the decision-maker.
- Establish a Plan that is able to implement the identified improvements to drought-related decision-making; and
- Establish a Team with members who will commit resources.

Applicants may propose concepts that would:

- Enhance the performance of *existing* drought-related decision-making activities and processes through the integration of NASA Earth science products; or
- Develop new capabilities for drought-related decision-making, provided that the need and activity can be clearly defined, end-users are clearly defined, and transition of application is possible within one to four years.

Section 4.5 of this appendix provides guidance and specific information to include in the Feasibility-Stage 1 proposal, Section 4.6 provides the Evaluation Criteria for Feasibility-Stage 1 proposals, and Section 4.7 specifies the reporting requirements for Feasibility-Stage 1.

2.2.2 *Scope: Decisions-Stage 2*

For those projects selected to continue work, this stage of the award will pursue implementation of the enhancements to the performance of the decision-making for the drought-related challenge. Decisions-Stage 2 award continuations will be awarded upon review of Feasibility-Stage 1 results. Section 4.7 specifies reporting requirements for projects.

Feasibility-Stage 1 results will be evaluated based on the following factors:

1. Addresses solicitation priority topics (Section 2.1);
2. Demonstrated feasibility and measurable impact to identified decision-making function;
3. Recognition and viability of necessary science and technology;
4. PI and team expertise, influence, and experience;
5. Well-conceived project plan, including a transition plan with clear objectives;
6. Viability of partnership agreements and financial plan.

Commitment from the end-users is critical to the eventual success of the project. Therefore, Decisions-Stage 2 options must demonstrate a strong interest and commitment by the end-users of the decision-making activity to adopt the results from the proposed work. The Program expects active leadership by partner decision-making organizations in the Feasibility-Stage 1 project and throughout the Decisions-Stage 2 option. Resource commitments are expected from partner organizations throughout Decisions-Stage 2 options.

For example; this is a notional transition of fiscal responsibility to partner:

- **Year 1** (Feasibility) Initiate/Establish projects (~100% NASA, ~0% partner)

OPTION

- **Year 2** (Decisions) Continue projects (~75% NASA, ~25% partner)
- **Year 3** (Decisions) Continue projects (~65% NASA, ~35% partner)
- **Year 4** (Decisions) Complete and transition the projects (~50% NASA, ~50% partner)
 - In Year 4, plan for transition activities and end-of-project event to recognize results

POST-TRANSITION

- **Year 5** (Decisions) Posttransition coordination (~0% NASA, ~100% partner)

NASA is committed to supporting partners through the transition and sustained use of Earth observations following the active project funding. The transition plan is encouraged to anticipate continued partnership activities to enable sustained use.

2.3 Specific Suggestions and Considerations

The Applied Sciences Program strongly encourages projects to use an array of Earth science research results, including multiple spacecraft observations, geophysical parameters, and Earth system models, and predictive capabilities. The Program encourages project teams to consider and use products from recently-launched NASA missions, as well as simulated products from upcoming, planned missions such as SMAP, LDCM, NPP, GPM, GRACE-FO, SWOT.

The Program encourages multiorganizational and multidisciplinary teams. The Program encourages teams to consider having Principal Investigators that are from or are very familiar with the needs of the end-users and decision-making organization(s). If the project requires that leadership be split between individuals at two institutions (one to lead technical aspects of the project and one to lead the decision-making and project management aspects of the project) the award can be split, with separate grants to the two institutions. The Program encourages early interaction with personnel knowledgeable of NASA science, model, and sensors (e.g., science teams and instrument scientists) to understand capabilities and limitations.

3. Program Information

Total Amount of Funding (FY12-16)	\$6 M total
Anticipated Feasibility (Stage 1) Number of Awards	5-10 projects
Expected Range of Feasibility (Stage 1) Award per project	\$100K - \$200K
Period of Performance (Stage 1)	1 year
Expected Project Start Date (Stage 1)	6 months after proposal due date.
Contributions from Partner Organizations (Stage 1)	Strongly encouraged. However, partner funding does not count toward funding level guidelines.
Anticipated Decisions (Stage 2) Number of Awards	3 - 6 projects
Expected Range of Decisions (Stage 2) Award per project	\$275K - \$550K (per annum funding scenarios depend on partnerships/cost sharing levels)
Period of Performance (Stage 2)	3 years
Expected Project Start Date (Stage 2)	18-20 months after proposal due date
Contributions from Partner Organizations (Stage 2)	Transition plan with resource commitments from partner organizations is expected

4. Differences with the *Summary of Solicitation* and Guidebook for Proposers

This section enumerates the ways in which this particular call adds to or differs from the *Summary of Solicitation* of this NRA and the Guidebook for Proposers. The information below supersedes direction provided in the respective sections of the *Summary of Solicitation* or Guidebook.

4.1 Funding and Award Policies: Changes to Section II(a) of the *Summary of Solicitation*

For proposals that request a cooperative agreement, the proposal should describe the support envisioned from NASA. NASA will work with the awardees regarding Earth science results, observations, models, data management issues, interoperability standards, and other relevant activities. NASA capabilities in support of the technical and interoperability standards are available at the NASA Centers, as described in the NASA Earth Science Strategic Plan at <http://science.hq.nasa.gov/strategy/>. Projects involving private sector organizations and/or proprietary products and services are strongly encouraged to read NASA guidelines on cooperative agreements.

4.2 Award Period of Performance: Changes to Section II(c) of the *Summary of Solicitation*

The period of performance for Feasibility-Stage 1 is 12 months. An annual review will be held according to the criteria specified in the [NASA Grants and Cooperative Agreement Handbook](#) (14 CFR 1260). Proposals must define clear, measurable milestones to be achieved in order to warrant an award continuation (Decisions-Stage 2) of the award for no more than 36 additional months. Feasibility-Stage 1 awards DO NOT guarantee approval of a Decisions-Stage 2 award

continuation.

4.3 Eligibility Information: Changes to Section III(a) of the *Summary of Solicitation*

All organizational sectors are eligible to apply, including academia, private, Government, and nonprofit sectors. Multiorganizational and multidisciplinary teams are strongly encouraged.

4.4 Cost Sharing or Matching: Changes to Section III(c) of the *Summary of Solicitation*

Cost-sharing and partner resource commitments for Feasibility-Stage 1 proposals are encouraged, but optional. Cost-sharing and partner resource commitments for Decisions-Stage 2 proposals continuations are expected. While the solicitation accepts in-kind contributions during the course of the project as cost sharing, financial contributions are preferred. Relevant past work, prior results, or previous support and accomplishments can be described, but the Program does not consider these as cost sharing or in-kind contributions for proposals to this solicitation.

4.5 Proposal Format and Contents: Changes to Section IV(b)(ii) of the *Summary of Solicitation*

Proposals should adhere to the following page guidelines and order. Content descriptions, if specified below, modify Section 2.3 of the *NASA Guidebook for Proposers*.

Proposal Cover Page	As found on NSPIRES site or Grants.gov
.....	(includes budget summary)
Proposal Summary	300 words (on cover page)
Table of Contents	1 page
Decision-Making Activity – Description	½ - 1 page
Earth Science Products and Results	1 page
Feasibility Elements (including charts/figures/tables)	6 – 8 pages
- Figures and Tables (as appropriate; integrated into text if possible)	
Anticipated Results/Impacts	½ page
Project Management	1 page
Schedule with Milestones	1 page
Statements of Commitment – Co-Is	as needed
Letters from End-User Organizations	one-page letters
Budget Justification: Narrative and Details	as needed
Facilities and Equipment (if applicable)	1 page
Resume/Curriculum Vitae: Principal Investigator(s)	2 page
Each Co-Investigator	1 page
Current/Pending Support	as needed
References and citations	as needed

Proposal Summary

This section should state how the project responds and relates to the priority topics identified in Section 2.1 of this appendix.

Decision-Making Activity - Description

This section must explicitly identify and describe the decision-making activity to be enhanced (or created) in the project. The description should describe the management, business, policy topic, or other issue that it serves, including any quantitative information regarding its use. This section must identify and describe the end-user organization(s) and their responsibility and/or mandate to address the topic/issue.

Earth Science Products and Results

This section must identify and describe the Earth science products and results that the proposal seeks to integrate to improve the decision-making activity. This section should include non-NASA data sets that are expected to play an important role in the applications (e.g., commercial satellite data, specific geospatial datasets, etc.).

Feasibility Elements

As the main body of the proposal, this section should cover the following material:

- Objectives of the proposed activity and relevance to NASA's *Strategic Goals and Outcomes* given in Table 1 in the *Summary of Solicitation* of this NRA and solicitation requirements;
- Methodology to be employed, including discussion of the innovative aspects and rationale for NASA Earth science products and results to be integrated;
- Approach to assess the feasibility of an application, including technical aspects and its value to the decision making related to the drought-related challenge
- Organizational/Management approach to discover solutions and plan the integration of Earth science results into the decision-making activity (existing or new);
- Criteria and measures (both quantitative and qualitative) the team will use to determine the feasibility of the approaches and applied NASA Earth science products and results;
- Estimate of the ARL of the application, including any expected improvements from beginning to end of Stage 1;
- Challenges and risks affecting project success (technical, policy, operations, management, etc.) and the approach to address the challenges and risks; and
- Relevant tables/figures that demonstrate key points of the proposal.

Anticipated Results/Improvements

This section must describe the expected results from the project. This section must state the team's hypothesis for the expected quantitative improvement(s).

Project Management

This section should articulate the management approach and structure; plan of work; partnership arrangements; and the expected contribution, roles, and responsibilities of the team members. Project schedule and milestones must be included. Note: Meetings (number of, frequency of, etc.) do not qualify as project management milestones.

Statements of Commitment

In addition to the brief statements from Co-Is required per Section 2.3.10 of the *NASA Guidebook for Proposers*, this section may include up to four, one-page letters from the end-user organizations that will benefit from the proposed project. The letters may include input from the

community and beneficiaries served by the end-user organizations. All statements or letters must be addressed to the PI and included in the proposal.

Budget

The NASA Science Mission Directorate has adopted commercial data purchases as a mainstream way of acquiring research-quality data, as these commercial capabilities become available. Per NASA policy, NASA encourages the use of commercially-available data sets³ by Principal Investigators, as long as it meets the scientific requirements and is cost effective. In addition to the budget guidance in the *Summary of Solicitation*, the proposal should identify the commercial data sources intended for use and details on the associated cost.

4.6 Evaluation Criteria: Subfactors for Section V(a) of the Summary of Solicitation and Section C.2 of the NASA Guidebook for Proposers

In addition to the factors given in the *NASA Guidebook for Proposers*, the evaluation criterion “relevance to NASA's strategic goals and objectives” specifically includes the following factors:

- Overall intent and ability to demonstrate the utility of Earth science results to address a topic of importance;
- Overall intent and ability to apply Earth science results to make potentially valuable, substantive improvements to the drought-related challenge and decision-making activities; and
- Breadth and potential impact of the project.

In addition to the factors given in the *NASA Guidebook for Proposers*, the evaluation criterion “intrinsic merit” specifically includes the following factors:

- Overall ability to develop and test the feasibility of the proposed concept;
- Overall plan and ability to use Earth science products and results (NASA Earth Science and other), model outputs, simulated products from planned missions, etc.;
- Overall ability to characterize the decision-making activities; and,
- Quality and extent of teaming across appropriate sectors and areas of expertise and the involvement of end-user organization(s) in the project.

In addition to the factors given in the *NASA Guidebook for Proposers*, the evaluation criterion “cost realism” specifically includes the following factors:

- Overall approach and ability to manage the project and achieve stated objectives; and
- Overall feasibility of the proposed work to cost-effectively meet identified needs and enable sustained results following completion of the project.

Cost sharing is not part of the Stage 1 proposal evaluation criteria. At the time of project selection, when deciding between proposals of otherwise equal merit, NASA will consider the extent to which the proposed project includes funds or in-kind contributions from non-Federal sources and Federal agencies, consistent with Section 4.4 of this appendix and Section III(c) of the *Summary of Solicitation*.

³ Commercial remote sensing data that has been validated by the Joint Agency Commercial Imagery Evaluation (JACIE, <http://calval.cr.usgs.gov/jacie.php>) are encouraged.

4.7 Award Reporting Requirements: Changes to Section VI(c) of the *Summary of Solicitation*

The following reports will be required of awarded proposals. In cases where teams of organizations or subcontracts exist, consolidated project reports, including financial records, must be submitted and is the responsibility of the lead organization. The proposed budget should provide for these reporting requirements.

Feasibility-Stage 1:

Each project will be responsible for timely maintenance on-line (e-Books) project information, status updates, highlights, and milestone achievements. NASA will coordinate with each PI at award to provide the necessary information for the on-line system. This reporting/communication tool is critical to ensuring each project gets the recognition it deserves, as well improving communication about milestones, deadlines, and project specific events.

Feasibility-Stage 1 only:

Progress reports will be required each quarter of the Feasibility-Stage 1 projects, including a Final Report no later than 12 months after the project start date.

Progress Reports: Progress reports should describe the effort to identify, test, prove, and/or demonstrate the “feasibility” of Earth science products to affect water management decisions as applied to drought. The “feasibility” of these projects to succeed will be monitored through three Progress Reports and a Final Report using the following general outline in a one-page quad-chart format (provided upon award): Project Objectives, Project Science/Technology, Project Organization, and Project Status/Milestones.

Final Report: The Final Report should include all requirements of the quarterly Progress Reports, plus a synopsis of the Feasibility-Stage 1 conclusions. This Final Report should include how the project met the solicitation requirements, demonstrated an impact on decision-making activities using relevant and sustainable science/technology, and provided a clear transition plan and estimate cost of transition the application to responsible groups⁴. The report should also explain any variations in the anticipated results and a discussion of major problems (technical or other). The report should also include lessons learned and recommendations. The Program may request a presentation of the project report, results, and findings.

Decisions-Stage 2: *(Details of reporting requirements will be provided upon continuation award)*

5. Summary of Key Information

Expected total program budget	~ \$6M total, see Section 3
Number of new awards pending	~ 5-10 – Stage 1

⁴ The Final Report and Progress Reports, including other factors, will be evaluated to down-select for Decisions-Stage 2 continuation. Upon Decisions-Stage 2 continuation selection, the Program will request a formal project plan and budget for implementation and clarify Stage 2 reporting.

adequate proposals of merit	~ 3-6 – Stage 2
Maximum duration of awards	4 years
Supplemental EPO Eligibility	Yes, for awards >1 year; see Appendices E.5 and E.6
Due date for Notice of Intent to propose (NOI)	Friday, July 1, 2011
Due date for proposals	Friday, September 30, 2011
Planning date for start of investigation	6 months after proposal due date.
Page limit for the central Science-Technical-Management section of proposal	See Section 4.5
Relevance to NASA	This program is relevant to the Earth science strategic goals and subgoals in NASA's <i>Strategic Plan</i> ; see Table 1 and the references therein. Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the <i>ROSES Summary of Solicitation</i> .
Detailed instructions for the preparation and submission of proposals	See the <i>NASA Guidebook for Proposers</i> at http://www.hq.nasa.gov/office/procurement/nraguidebook/ .
Submission medium	Electronic proposal submission is required; no hard copy is required or permitted. See Section IV of the <i>ROSES Summary of Solicitation</i> and Chapter 3 of the <i>NASA Guidebook for Proposers</i> .
Web site for submission of proposal via NSPIRES	http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposal via Grants.gov	http://grants.gov/ (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH11ZDA001N-WATER
NASA point of contact concerning this program	Bradley D. Doorn Applied Sciences Program Earth Science Division Science Mission Directorate NASA Headquarters Washington, DC 20546-0001 Telephone: (202) 358-2187 E-mail: Bradley.Doorn@nasa.gov